

allyl-based prepolymer containing a thioether group (or a halogen atom) can be used singly or in combination of two or more of them. Furthermore, the homopolymer or copolymer of an allyl-based monomer can be used in combination with the organic-inorganic complex transparent material and/or the allyl-based prepolymer containing a thioether group (or a halogen atom).

It is particularly preferred that the diallylphthalate-based prepolymer is a prepolymer that can be subjected to post-polymerization having a softening temperature of from 50 to 110°C, an iodine value measured by the Wijs method of from 50 to 95, a viscosity as a methyl ethyl ketone 50% solution (30°C) of from 50 to 300 cp, and an average molecular weight of polystyrene conversion measure by the GPC (gel permeation chromatography) method of from 10,000 to 100,000, and preferably from 30,000 to 60,000.

The hologram recording material composition of the invention can further contain a solvent-soluble thermoplastic resin (D) in addition to the allyl-based prepolymer (A), the (meth)acrylate-based compound (B) and the photo-polymerization initiator (C). The weight proportion of the thermoplastic resin (D), in terms of a weight ratio to the allyl-based prepolymer (A), (A) : (D) is from 80 : 20 to 100 : 0, and preferably from 85 : 15 to 100 : 0. The thermoplastic resin (D) is selected in such a manner that a difference between the refractive index of the polymer of the (meth)acrylate-based compound (B) and the weighted mean of those of the allyl-based prepolymer (A) and the thermoplastic resin (D) is 0.01 or more. As the solvent-soluble thermoplastic resin (D), those having a refractive

index of from 1.300 to 1.800 are preferably used in the present invention. Specific examples thereof include a condensation polymerization product of a diphenol compound and a dicarboxylic acid compound, a resin having a carbonate group in the molecule, a resin having an $\text{-SO}_2\text{-}$ group in the molecule, polyvinylidene chloride, and a homopolymer or copolymer obtained by polymerizing at least one monomer having an ethylenic unsaturated double bond. These polymers can be used singly or in combination of two or more thereof.

Examples of the condensation polymerization product of a diphenol compound and a dicarboxylic acid compound include polyarylate. Examples of the resin having a carbonate group in the molecule include polycarbonate. Examples of the resin having an $\text{-SO}_2\text{-}$ group in the molecule include polysulfone and polyether sulfone. Examples of the homopolymer or copolymer obtained by polymerizing a monomer having an ethylenic unsaturated double bond include polystyrene, polymethyl methacrylate, an ethylene-vinyl acetate copolymer, polymethylpentene, a cyclic olefin polymer, and a copolymer of a cyclic olefin and ethylene.

In order to obtain a high diffraction efficiency, polyarylate, polycarbonate and polysulfone are preferably used.

The (meth)acrylate-based compound (B) used in the invention is a compound having at least one polymerizable unsaturated group, such as a (meth)acryl group, in the molecule, and is a compound obtained by esterification of (meth)acrylic acid with a monovalent or polyvalent alcohol, and an oligomer, such as a dimer and a trimer, thereof. The (meth)acrylate-based compound (B) can be fluorene (meth)acrylate. In

general, a polymer of the (meth)acrylate-based compound (B) has a refractive index smaller than that of the allyl-based prepolymer (A), provided that a polymer of fluorene (meth)acrylate has a refractive index larger than the refractive index of the allyl-based prepolymer (A). The (meth)acrylate-based compound (B) has at least one, preferably from 1 to 6, (the most preferably two) polymerizable unsaturated group in the molecule. The (meth)acrylate-based compound (B) has a molecular weight of preferably 2,000 or less, and more preferably 1,500 or less. The (meth)acrylate-based compound (B) is selected depending on the extent of the refractive index modulation and the usage of the resulting hologram.

The (meth)acrylate-based compound (B) can comprise from 10 to 100% by weight of at least one radical polymerizable compound (b1) selected from the group consisting of a fluorene-based compound [I], a sulfide-based cyclic compound [II], a halogenated cyclic compound [III] and a carbazole-based compound [IV] mentioned later.

(Meth)acrylate-based compound (B) are exemplified as follows.

Examples of mono(meth)acrylate include the following. Methyl methacrylate, ethyl methacrylate, n-butyl methacrylate, isobutyl methacrylate, 2-ethylhexyl methacrylate, isodecyl methacrylate, n-lauryl methacrylate, n-stearyl methacrylate, methoxydiethylene glycol methacrylate, cyclohexyl methacrylate, tetrahydrofurfuryl methacrylate, benzyl methacrylate, phenoxyethyl methacrylate, isobornyl methacrylate, 2-hydroxyethyl methacrylate, 2-hydroxypropyl methacrylate, 2-hydroxyethyl acrylate, 2-hydroxypropyl acrylate, 2-hydroxybutyl methacrylate, dimethylaminoethyl methacrylate, diethylaminoethyl